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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/731,945	12/07/2000	John C. Waldrop III	99-113A	9765

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EXAMINER	
DANIELS, MATTHEW J	
ART UNIT	PAPER NUMBER
1732	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/731,945	WALDROP ET AL.	
	Examiner	Art Unit	
	Matthew J. Daniels	1732	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *13-15,18-27 and 34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *13-15,18-27 and 34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Rejections set forth previously under this section are withdrawn in favor of the following rejections.

3. Claims 13, 20-22, 25, 27 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hooper (US Patent No. 5,576,030) in view of Cochran *et al.* (US Patent No. 5,116,216) and Lang *et al* (US Patent No. 6,406,659).

Hooper ('030) teaches the basic claimed process of making a fiber reinforced composite including, providing a preform laminate (20), placing said perform laminate (20) onto a mold (12), providing a first bag (32) against said mold (12) to form a first chamber, sealing a second bag which is a vacuum bag against said mold (12), drawing a vacuum onto said first bag and said second bag using port (16), a second port (44), and infusing a resin using port (42) (see col. 4, line 43 through col. 5, line 33).

Regarding claims 13 and 34, although Hooper ('030) teaches a first and a second bags, Hooper ('030) does not teach that the first bag is a vacuum bag and is sealed to the mold, or that

the pressure in the second vacuum chamber is equal to or greater than the pressure in the first vacuum chamber.

However, Lang *et al* teach a first (185) and second (189) vacuum bags, each sealed to the mold (183). Lang *et al* further teach that the vacuum or pressures in the first and second bags are separately manipulated to provide resin flow channels or resin distribution (9:60-10:28), and doing so substantially collapses the second vacuum chamber against the first vacuum chamber (Fig. 10), resulting in resin flow channels (203). Thus, in view of the teaching to manipulate pressure in the two vacuum chambers (7:15-40, 8:38-46, and Claim 1), the particular pressures represent result effective variables that the ordinary artisan would modify, adjust, and optimize in order to provide resin channels or distribution.

Cochran *et al.* ('216) teach a resin impregnation process including, providing a fibrous pre-preg (61), placing said pre-preg (61) onto a mold (71), sealing a first vacuum bag (89) against said mold (12) to form a first vacuum chamber, sealing a vacuum cover (93) to form a second vacuum chamber, drawing a vacuum onto said first vacuum chamber and onto second vacuum chamber such that the pressure within said second chamber is higher than the pressure within said first chamber and impregnating said fibrous pre-preg by applying heat (see col. 5, line 60 through col. 6, line 11 and Figure 3).

It would have been obvious for one of ordinary skill in the art to combine the methods of Cochran *et al* and Lang *et al* for the following reasons:

(a) Hooper suggests a need to insure that the vacuum path remains open so that it is equally drawn from all areas of the lay up (2:42-49) and to distribute the resin in a way that even resin

distribution is ensured (2:57-63) using two impermeable sheets (32,36), and this is substantially what is provided by Lang (3:7-4:40).

(b) It would have been obvious for one of ordinary skill in the art to provide a higher pressure within the second vacuum chamber as compared to the first vacuum chamber as taught by Cochran *et al.* ('216) in the process of Hooper ('030) because Cochran *et al.* ('216) specifically teaches that a higher pressure in the second vacuum pressure provides for improved gas removal, hence providing for a porous free product that exhibits improved characteristics.

Regarding claim 14, Hooper ('030) and Cochran *et al.* ('216) do not teach debulking the preform. Lang *et al.* ('659) teach a vacuum assisted resin transfer process including, applying a vacuum to a first vacuum chamber prior to resin infusion in order to eliminate entrapped air bubbles, hence teaching debulking of the preform prior to resin infusion (see col. 3, lines 7-10). Therefore, it would have been obvious for one of ordinary skill in the art to debulk the preform as taught by Lang *et al.* ('659) in the process of Hooper ('030) in view of Cochran *et al.* ('216) because, Lang *et al.* ('659) teach that debulking eliminates entrapped air bubbles, hence providing for a porous free product that exhibits improved characteristics.

In regard to claim 22, Hooper ('030) teaches a breather layer (34) positioned between the inner and outer vacuum bags (see col. 5,lines 13-18).

Specifically regarding claim 25, Hooper ('030) teaches a first vacuum port or tube (16) for drawing a vacuum onto said first vacuum chamber and a second vacuum port or tube (44). Additionally, Lang teaches that the vacuum or pressure of within the first and second bags should be adjusted and manipulated separately (cols. 3 and 4), and thus first and second vacuum

tubes would have been prima facie obvious in the combined method in order to achieve the objectives of Lang *et al.*

Regarding claim 27, Hooper ('030) teaches a first impervious layer formed by the inner bag (32) and the mold (12). Further, Hooper ('030) teaches a second impervious layer formed by the outer bag (37) and the mold (12), wherein the second vacuum chamber includes the inner bag (32) (see Figure 1). Additionally, Lang *et al* teaches first and second bags that are first and second vacuum chambers in order to improve resin distribution, and fulfill the claimed configuration.

Regarding claims 20-21, Hooper ('030) teaches a resin distribution medium (24) that is positioned between the fiber preform (20) and the first vacuum (32). Further, Hooper ('030) teaches that said resin distribution medium is a mesh (see col. 4, line 58 through col. 6, line 3). It is submitted that the purpose of a resin distribution medium is to control the infusion flow and to create flow resistance because a resin distribution system forms a screen of open space that tends to wick the resin

4. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hooper (US Patent No. 5,576,030) in view of Cochran *et al.* (US Patent No. 5,116,216), Lang *et al.* (US Patent No. 6,406,659 B1) and further in view of White et al. (725).

Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) teaches the basic claimed process as described above.

Regarding claim 15, Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) do not teach tackifying the preform by heating the first vacuum chamber prior to applying vacuum. White *et al.* (725) teach molding a fiber composite including, providing a fiber preform

that includes a tackifier resin, partially curing (heating) the tackifier resin to form a tackified preform, impregnating said tackified preform with a resin and co-curing the tackifier resin and the impregnated resin to form the fiber composite (see Abstract). It would have been obvious for one of ordinary skill in the art to first heat the fiber reinforced preform in order to tackify said preform as taught by White *et al.* ('725) in the double vacuum bag process of Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) because, White *et al.* ('725) specifically teach that tackifying provides for net-shape molding of composites by allowing stacking of individual layers in a single operation, which in turn reduces production time, hence increasing productivity.

5. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hooper (US Patent No. 5,576,030) in view of Cochran *et al.* (US Patent No. 5,116,216), Lang *et al.* (US Patent No. 6,406,659 B1) and further in view of Palmer *et al.* (US Patent No. 4,942,013).

Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) teaches the basic claimed process as described above.

Regarding claim 18, Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) do not teach providing passive vacuum chambers in the first vacuum chamber. Palmer *et al.* ('013) teach a vacuum assisted resin impregnation process including, providing passive vacuum chambers, such as, a coiled wire (spring) or a perforated tube (see col. 10, lines 12-37 and Figures 2, 2A, 2B and 2C) as an equivalent alternative to a mesh for distributing resin. Therefore, it would have been obvious for one of ordinary skill in the art to provide passive vacuum chambers as taught by Palmer *et al.* ('013) as an equivalent alternative to the mesh resin distribution medium in the process of Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et*

al. ('659) because, Palmer *et al.* ('013) specifically teaches that passive vacuum chambers, such as, a coiled wire (spring) or a perforated tube (see col. 10, lines 12-37 and Figures 2, 2A, 2B and 2C) are an equivalent alternative to a mesh for distributing resin.

6. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hooper (US Patent No. 5,576,030) in view of Cochran *et al.* (US Patent No. 5,116,216), Lang *et al.* (US Patent No. 6,406,659 B1) and further in view of White et al. (725).

Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) teaches the basic claimed process as described above.

Regarding claim 19, Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) do not teach tackifying the preform by heating the first vacuum chamber prior to applying vacuum. White *et al.* (725) teach molding a fiber composite including, providing a fiber preform that includes a tackifier resin, partially curing (heating) the tackifier resin to form a tackified preform, impregnating said tackified preform with a resin and co-curing the tackifier resin and the impregnated resin to form the fiber composite (see Abstract). It would have been obvious for one of ordinary skill in the art to first heat the fiber reinforced preform in order to tackify said preform as taught by White *et al.* ('725) in the double vacuum bag process of Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) because, White *et al.* ('725) specifically teach that tackifying provides for net-shape molding of composites by allowing stacking of individual layers in a single operation, which in turn reduces production time, hence increasing productivity.

7. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hooper (US Patent No. 5,576,030) in view of Cochran *et al.* (US Patent No. 5,116,216), Lang *et al.* (US Patent No. 6,406,659 B1) and further in view of Imanara *et al.* (US Patent No. 5,364,584).

Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) teaches the basic claimed process as described above.

Regarding claim 23, Hooper ('030) in view of Cochran *et al.* ('216) do not teach an infusion direction that is tilted at an angle from the horizontal. Imanara *et al.* ('584) teach a molding process of a fiber reinforced matt including tilting the mold at an angle (see Figure 1). It would have been obvious for one of ordinary skill in the art to have tilted that mold assembly as taught by Imanara *et al.* ('584) in the process of Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) because, Imanara *et al.* ('584) specifically teach that tilting reduces the amount of voids in the final molded article, hence improving resin impregnation and product quality (see col. 4, lines 55-65).

In regard to claim 24, Imanara *et al.* ('584) teach that injection of resin occurs at a lower portion such that resin flows upwardly, hence against gravitation. Therefore, it would have been obvious for one of ordinary skill in the art to have injected resin at a lower portion of a mold such that resin flows against gravitation as taught by Imanara *et al.* ('584) in the process of Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) because, Imanara *et al.* ('584) specifically teach that tilting and injecting resin against gravitation reduces the amount of voids in the final molded article, hence improving resin impregnation and product quality (see col. 4, lines 55-65).

8. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hooper (US Patent No. 5,576,030) in view of Cochran *et al.* (US Patent No. 5,116,216), Lang *et al.* (US Patent No. 6,406,659 B1) and further in view of Stoeberl (US Patent No. 4,120,632).

Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) teaches the basic claimed process as described above.

Regarding claim 26 Hooper ('030) in view of Cochran *et al.* ('216) do not teach throttling the vacuum lines. Stoeberl ('132) teaches a vacuum molding process in which a resin is infused into a preform position in a mold cavity (see Figures 3c and 2b). Further, Stoeberl ('132) teaches the idea of throttling vacuum line (13) in order to provide uniform distribution of resin (9) throughout the fiber reinforcement (1) (see col. 4, lines 35-50). It is submitted that the uniform distribution of resin in Stoeberl ('132) by throttling the vacuum line results in equal mass flow rate of resin throughout the preform and the vacuum line. Therefore, it would have been obvious for one of ordinary skill in the art to have throttled vacuum lines as taught by Stoeberl ('132) in the process of Hooper ('030) in view of Cochran *et al.* ('216) and Lang *et al.* ('659) because, Stoeberl ('132) specifically teaches that throttling of a vacuum line provides uniform resin distribution throughout the fiber reinforcement and reduces porosity by allowing air to escape, hence improving product quality.

Response to Arguments

Applicant's arguments with respect to claims 13 and 34 have been considered but are moot in view of the new ground(s) of rejection. In particular, Applicants argue that there is no teaching of sealing two bags to a mold. However, this aspect of the invention is provided by Lang (USPN 6406659). This action is **Non-Final**.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Daniels whose telephone number is (571) 272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJD 3/20/07

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SUPERVISORY PATENT EXAMINER
3/20/07